

REMARKS

Claim 1 has been amended to limit the hydrophilic group Y to -COOH having a pKa of not more than 11, which is a part of the recitation of claim 2. Claim 2 has been amended to conform with the amendment to claim 1, and to recite that the hydrophilic group Y further contains -OH having a pKa value of not more than 11 (as an additional hydrophilic group). Claim 13 has been amended to delete the component (B), which is now recited in new claim 21. Further, claim 13 has been amended to recite that the number of moles of the carboxylic acid in 100 g of the fluorine-containing polymer (A1) is now listed at 0.14. Support is found, for example, bridging pages 13-14 in the specification.

Entry of the amendments and review and reconsideration on the merits are requested.

Claims 1-4, 11-13 and 15-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,057,080 to Brunsvold et al in view of U.S. Patent No. 7,214,470 to Araki et al.

Brunsvold et al was cited as disclosing a top antireflective layer and method of making a patterned photoresist composition by applying a photoresist to a silicon substrate and overcoating the photoresist with an antireflective film. Brunsvold et al was further cited as teaching use of perfluorinated polymers in the top antireflective layer for ease of removal with an alkaline developer. The Examiner relied on Araki et al as teaching fluorinated polymers for use as a base polymer in an antireflective coating having a structure said to be within the scope of the rejected claims. The reason for rejection was that it would have been obvious to use the fluorinated polymers of Araki et al in the antireflective layer of Brunsvold et al so as to maintain a low refractive index and improve optical characteristics.

Applicants respectfully request the Examiner to reconsider in view of the amendment to claims and the following remarks.

As previously discussed, Brunsvold et al state: "To overcome the deficiencies of fluorocarbon polymers which do provide nearly ideal refractive indexes (on the order of 1.3-1.4) but do not offer solubility or strippability in an aqueous media, we have tailored a number of different compositions which overcome these deficiencies." (col. 3, lines 45-49). That is, the invention of Brunsvold et al was made to overcome such deficiencies through other means. This is a clear teaching that fluorocarbon polymers having low refractive indexes cannot be used for replacing the top anti-reflective coating for photoresist layer of Brunsvold et al.

In the Advisory Action, the Examiner cited Araki et al as teaching a low refractive index fluorocarbon polymer in an antireflective layer.

However, the features of the amended claims require that:

- (i) the hydrophilic group Y contains -COOH having a pKa value of not more than 11, and
- (iii) the number of moles of the hydrophilic group Y in 100 g of the fluorine-containing polymer (A) is not less than 0.14.

Namely, the fluorine-containing polymer contains -COOH having a pKa value of not more than 11 in an amount of not less than 0.14 moles per 100 g of the fluorine-containing polymer (A). These features are critical and of patentable significance with regard to dissolution rate in a developing solution, which criticality is demonstrated in the Working Examples of the specification as follows.

In PREPARATION EXAMPLE 2 of the Applicants' specification, a fluorine-containing polymer having 0.170 moles of COOH was prepared. Also, in PREPARATION EXAMPLE 3, a fluorine-containing polymer having 0.135 moles of the COOH was prepared (TABLES 3 and

4). The polymer of PREPARATION EXAMPLE 2 is within the scope of the present claims, but the polymer of PREPARATION EXAMPLE 3 is not.

In Experimental Examples 4 and 6, coating compositions were prepared using the polymer of Prep. Ex. 2 and Prep. 3, respectively, and were evaluated with regard to dissolution rate in a developing solution (see TABLE 4). The results clearly show that the coating composition of Experimental Example 6 (0.135 moles of COOH) was "insoluble" in a developing solution, whereas that of Experimental Example 4 (0.170 moles of COOH) was "100". The result "insoluble in a developing solution" means that a polymer having 0.135 moles of the COOH cannot be used as an antireflective coating for photoresist layer, because the coating over the resist layer remains after the developing step.

As explained concretely in reference to the Working Examples of the specification, the features of (i) and (iii) are essential and critical for forming a laminated photoresist according to the present invention.

However, Araki et al. does not teach the criticality of (i) and (iii), and thus, the present invention is not obvious over Brunsvold et al. in view of Araki et al.

Withdrawal of the foregoing rejection under 35 U.S.C. § 103(a) is respectfully requested.

Withdrawal of all rejections and allowance of claims 1-4, 11-13, 15-18 and 21 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

AMENDMENT UNDER 37 C.F.R. § 1.114(c)
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